

5.2 Application of Similar Triangles

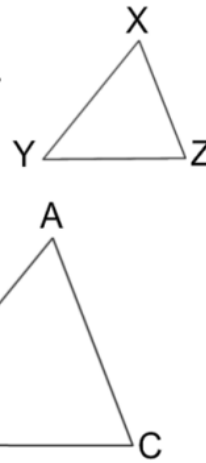
Solving Similar Triangle Problems

The **scale factor** is the ratio of corresponding sides in similar triangles.

If $\triangle XYZ \sim \triangle ABC$,
and n is the scale factor, then

$$n = \frac{AB}{XY}$$

* we often write the scale factor using the larger side over the smaller side



Similar triangles and the scale factor can be used to determine distances that are difficult (or impossible) to measure directly.

For example,

- distances across rivers and canyons
- heights of tall buildings or structures
- distances in outer space.

Steps:

1. Show triangles are similar using:
SSS~, SAS~, or AA~

2. Use properties of similar triangles to determine unknown quantities:

- corresponding angles are equal
- corresponding sides are proportional

$$\text{If } \triangle ABC \sim \triangle XYZ, \quad \frac{AB}{XY} = \frac{BC}{YZ} = \frac{AC}{XZ} \quad \begin{array}{l} \angle A = \angle X \\ \angle B = \angle Y \\ \angle C = \angle Z \end{array}$$

Example 1: A surveyor would be able to take these measurements

The two right triangles formed are similar. (why?)

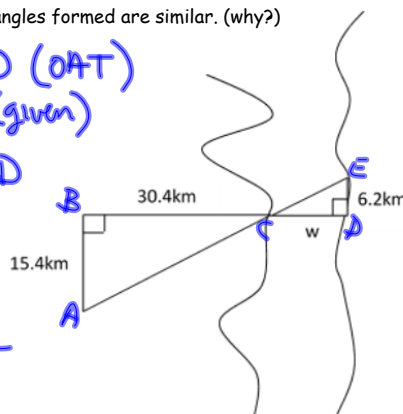
$$\begin{aligned}\angle ACB &= \angle ECD \text{ (OAT)} \\ \angle B &= \angle D \text{ (given)} \\ \therefore \triangle ACB &\sim \triangle ECD \\ &\text{by AA}\end{aligned}$$

$$\frac{15.4}{6.2} = \frac{30.4}{w}$$

$$\cancel{30.4} \cdot \frac{w}{\cancel{30.4}} = \frac{6.2}{15.4} \cdot \cancel{30.4}$$

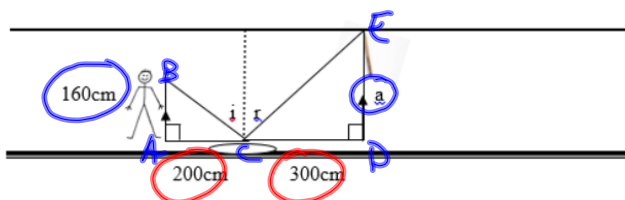
$$w = \frac{6.2 \times 30.4}{15.4}$$

$$w = 12.24$$



\therefore the river is 12.24 km wide.

Example 2: What is the height of the classroom?



The two right triangles formed are similar. (why?)

1. Angle of incidence and reflection are the same (law of reflection) $i = r$

$$\begin{aligned}2. \angle A &= \angle D \text{ (given)} \\ \therefore \triangle ABC &\sim \triangle DEC \\ &\text{by AA}\end{aligned}$$

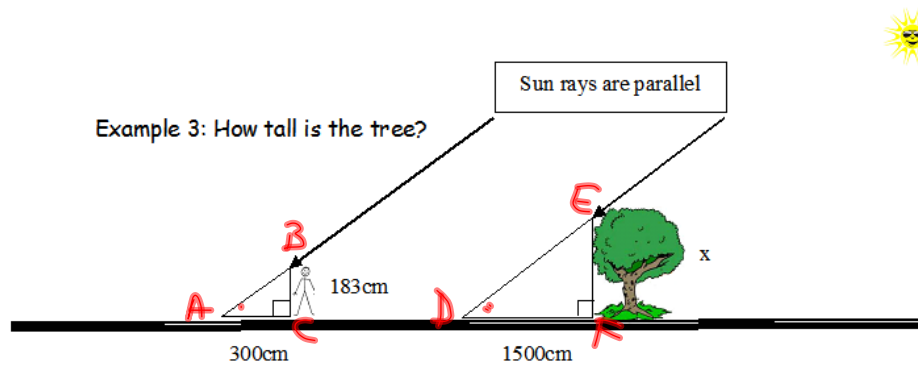
$$\frac{a}{160} = \frac{300}{200}$$

$$a = \frac{300 \cdot 160}{200}$$

$$a = 240$$

\therefore the height of the classroom is 240 cm

Example 3: How tall is the tree?



$\angle A = \angle D$ (Sun rays are parallel)
 $\angle C = \angle F$ (given)
 $\therefore \triangle ABC \sim \triangle DEF$
 by AA~

Assigned Work: p.386 # 4, 6, 9, 12, 14*